

**Appendix H9**

**Analysis of Receptor Exposure**

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### Attachment 1—Summary of WAG ERA Receptor Exposures

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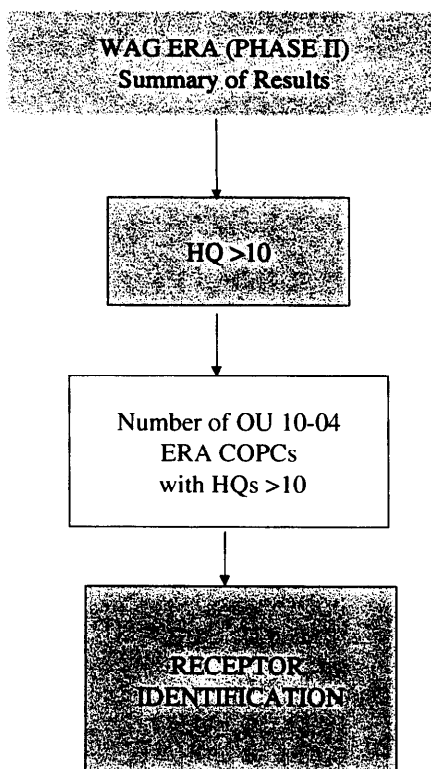
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## Appendix H9

### H9-1. ANALYSIS OF RECEPTOR EXPOSURE

The results of the WAG ERAs have also been incorporated to develop a preliminary list of receptors that were evaluated in the OU 10-04 ERA (Figure 1). All INEEL species and trophic linkages were represented in the ERAs by 36 functional groups and 14 T/E and other species of concern that were assessed individually. A summary of the WAG ERA methodology and receptors can be found in the OU 10-04 workplan (DOE/ID 1999).

Two processes were applied to identify receptors to be evaluated in the OU 10-04 ERA: (1) functional groups or individual species exceeding HQs of 10 for any OU 10-04 ERA COPC at more than 1 WAG were retained and (2) the number of OU 10-04 ERA COPCs for which HQs for those receptors exceeded 10 was summarized as a general indicator of spatial distribution of potential risk for groups and species.



**Figure 1.** Receptor identification process.

The number of OU 10-04 ERA COPCs is used to identify WAGs for which potential for receptor exposures is more likely and to allow prioritization of which COPCs should be evaluated first. The greater the number of COPCs that may have been dispersed, the greater the chance of exposures, especially for species with low mobility. COPC plume extensions were modeled for each WAG at which the contaminant occurred.

Risk shown by the ERAs (HQ>10) was used as an indicator for which receptors should be further evaluated in a site-wide assessment. The COPCs posing risk to receptor groups and species are summarized on Tables A-1 through A-11 of Appendix A. The results for receptor groups and individual species are presented in the following sections.

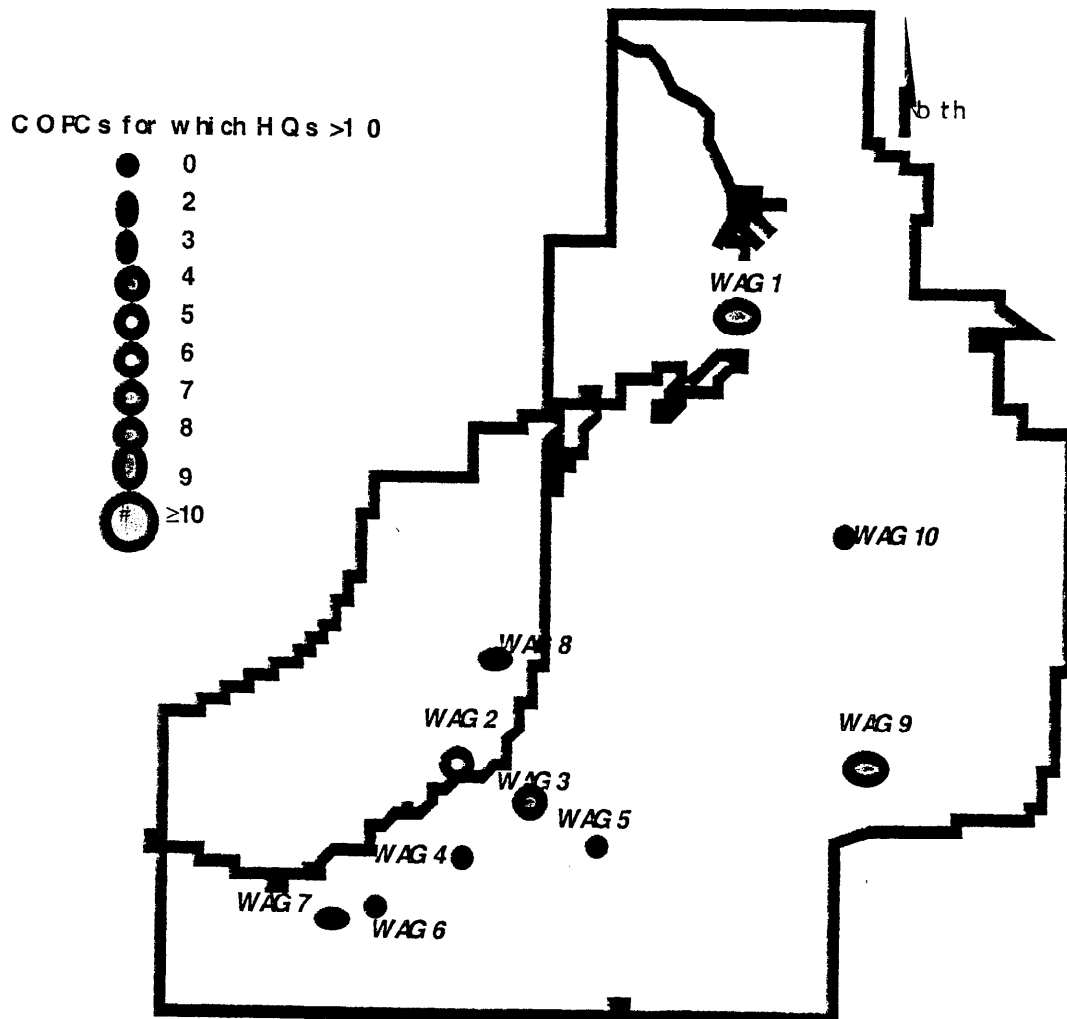
Functional groups were selected based on the results from the WAG ERAs (with the exception of WAGs 6 & 10) found in Appendix H6. An individual receptor was selected to represent each functional group. Individual receptors with their appropriate functional groups are presented in the following sections.

### **H9-1.1 Aquatic Receptors**

Aquatic receptors were not shown by the WAG ERAs to be at risk from exposures to facility ponds (i.e. industrial waste and waste disposal ponds). No permanent impoundments (natural or manmade) or natural drainages in which flows are sustained are encompassed by the OU 10-04 assessment areas. Aquatic receptors outside the fences are, therefore, unlikely to be exposed and will not be modeled in the ERA.

## H9-1.2 Plant Receptors

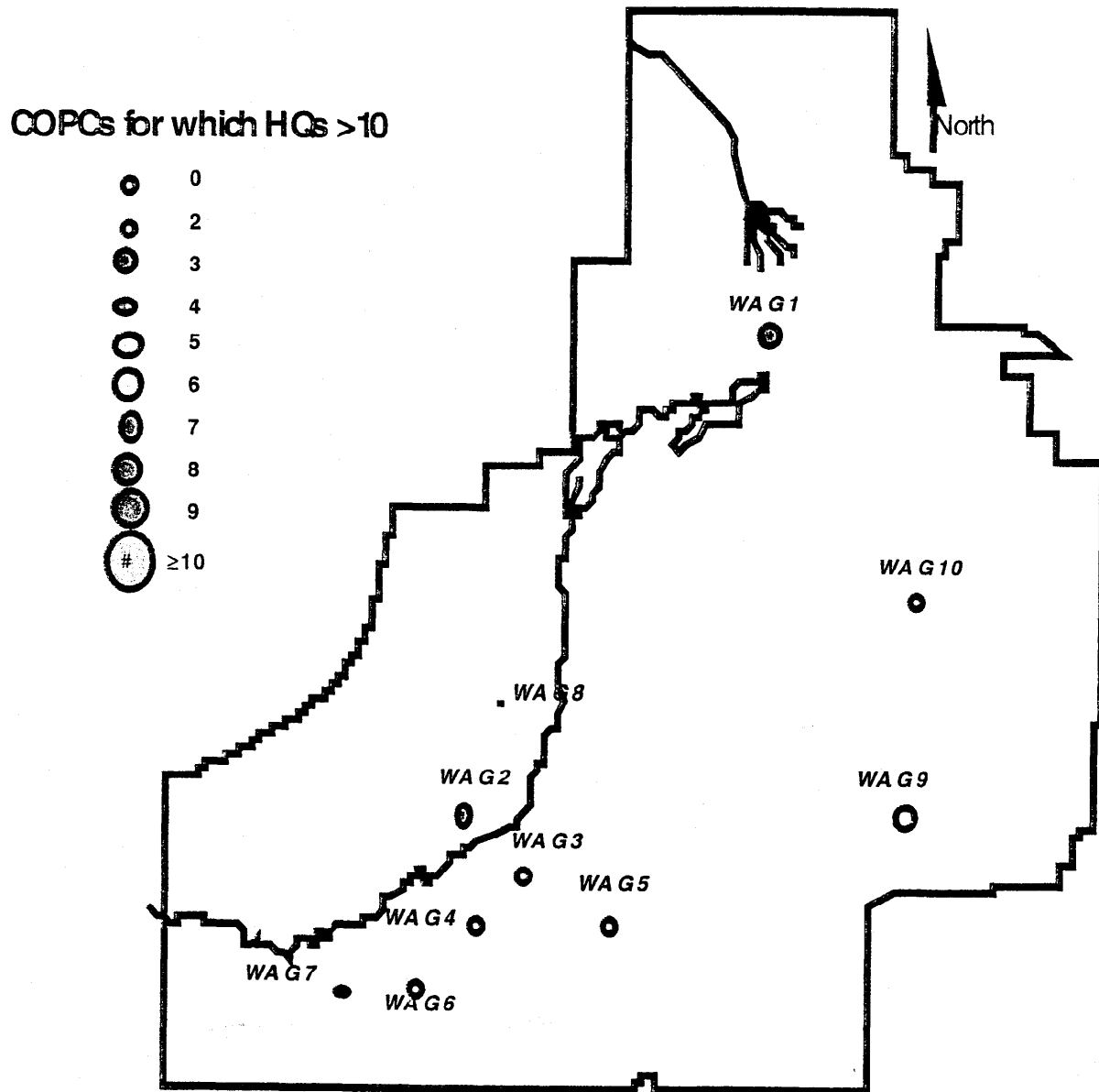
A summary of COPCs posing risk to plants is presented on Table A-6. A spatial summary of potential risk for plants is presented in Figure 2.



**Figure 2.** Summary of potential risk to plant receptors.

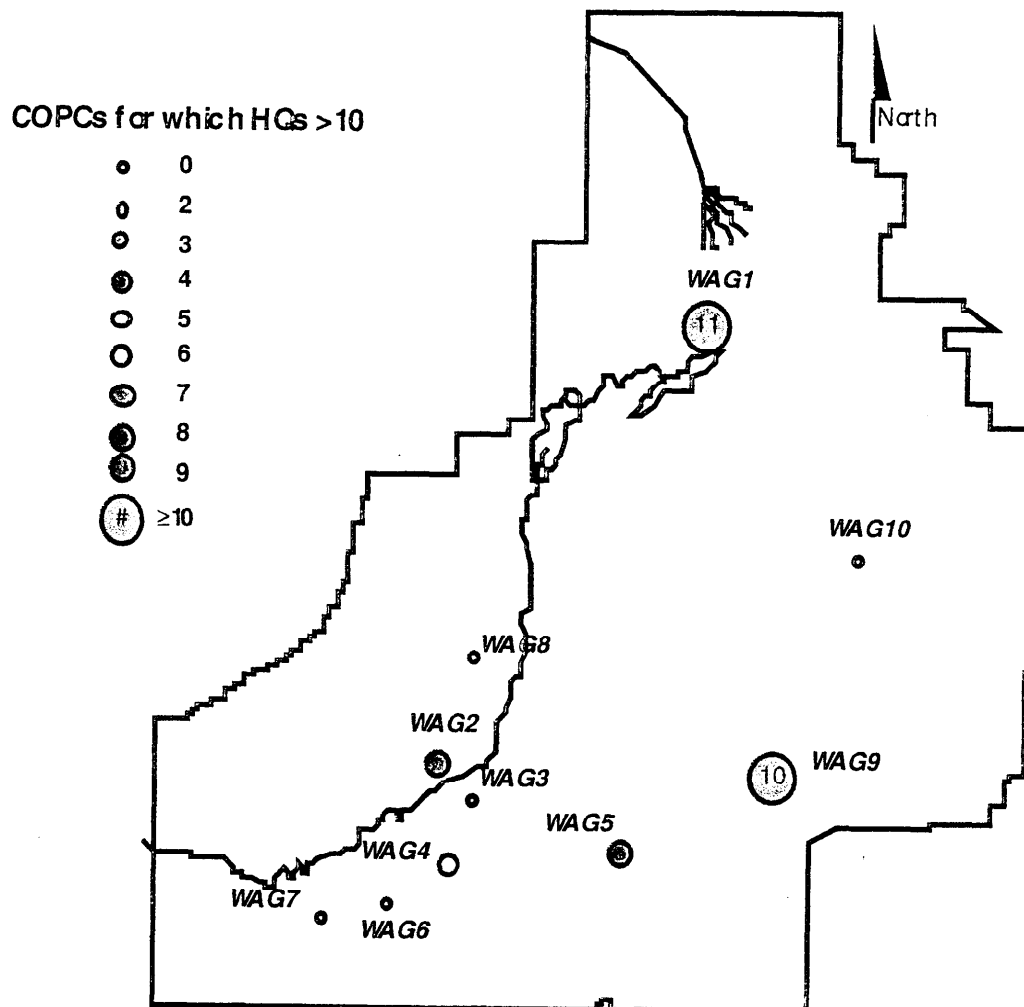
### H9-1.3 Avian Receptors

A summary of COPCs posing risk to avian herbivores is presented in Table A-3. A spatial summary of potential risk for avian herbivores is presented in Figure 3.



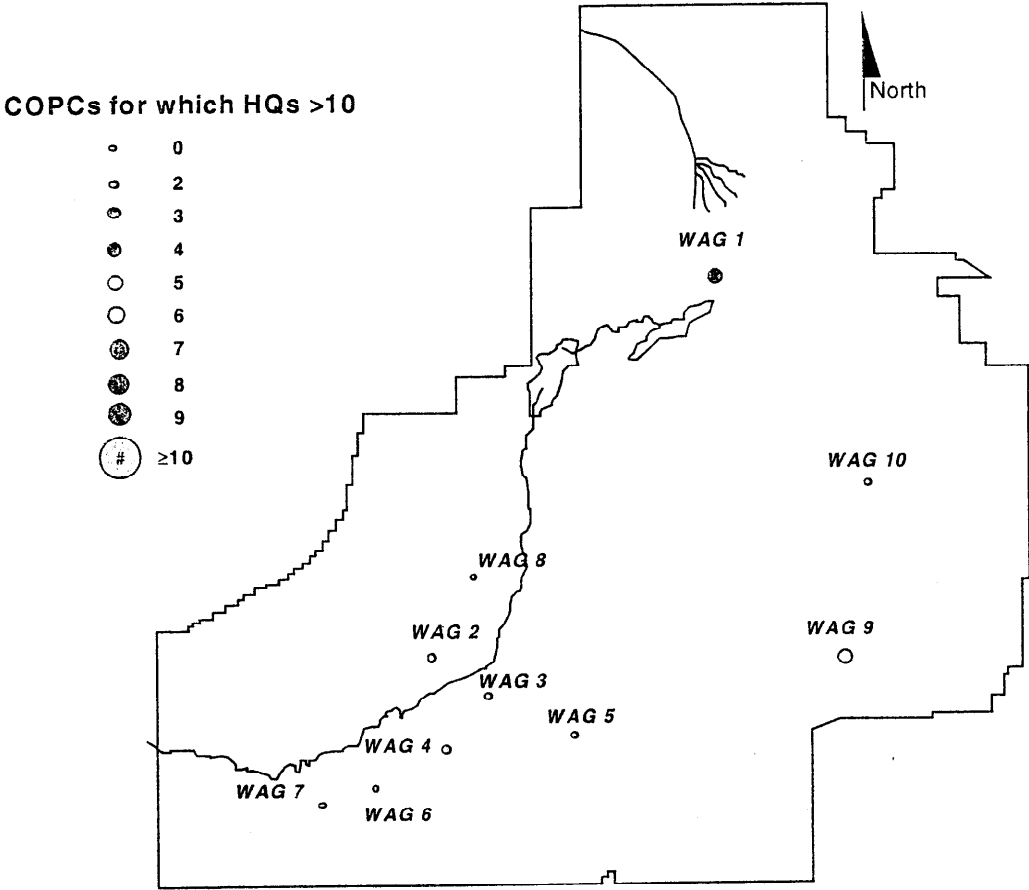
**Figure 3.** Summary of potential risk to avian herbivores (Mourning dove).

A summary of COPCs posing risk to avian insectivores is presented on Table A-5. A spatial summary of potential risk for avian insectivores is presented in Figure 4.



**Figure 4.** Summary of potential risk to avian insectivores (Sage sparrow).

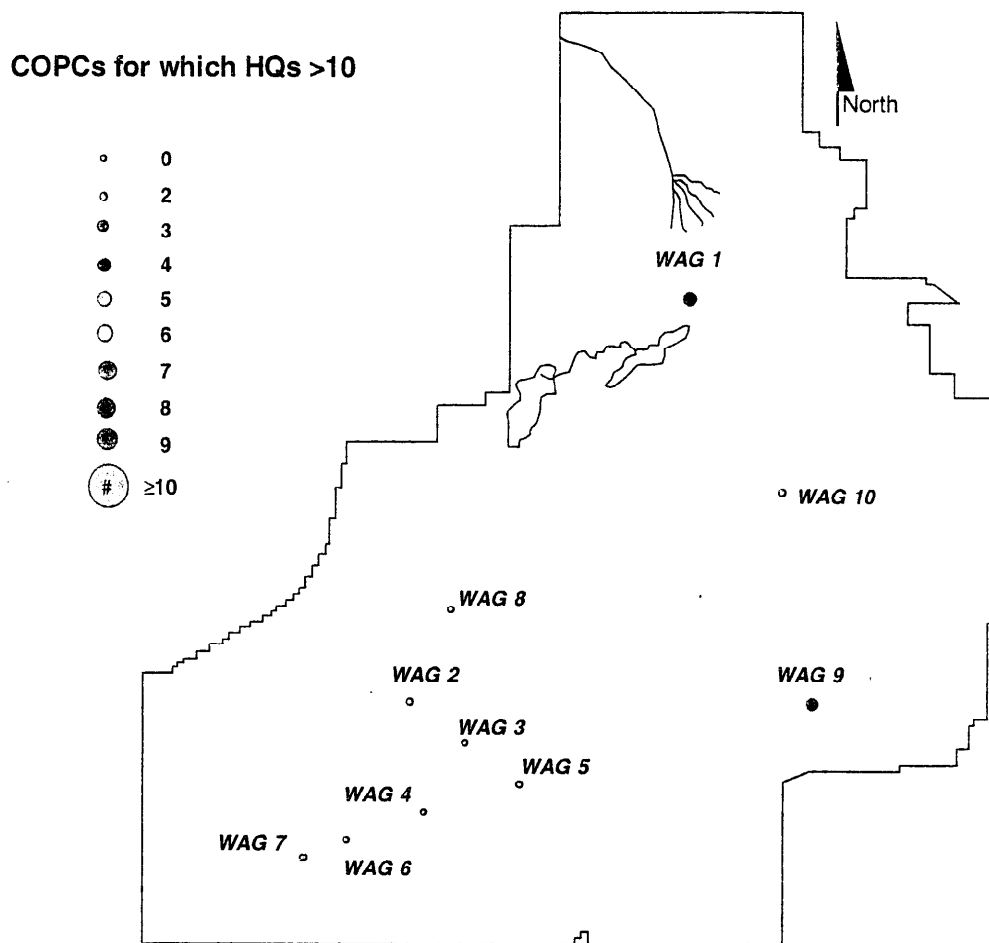
A summary of COPCs posing risk to avian carnivores is presented on Table A-11. A spatial summary of potential risk for avian carnivores is presented in Figure 5.



**Figure 5.** Summary of potential risk to avian carnivores (Loggerhead shrike, Burrowing owl).



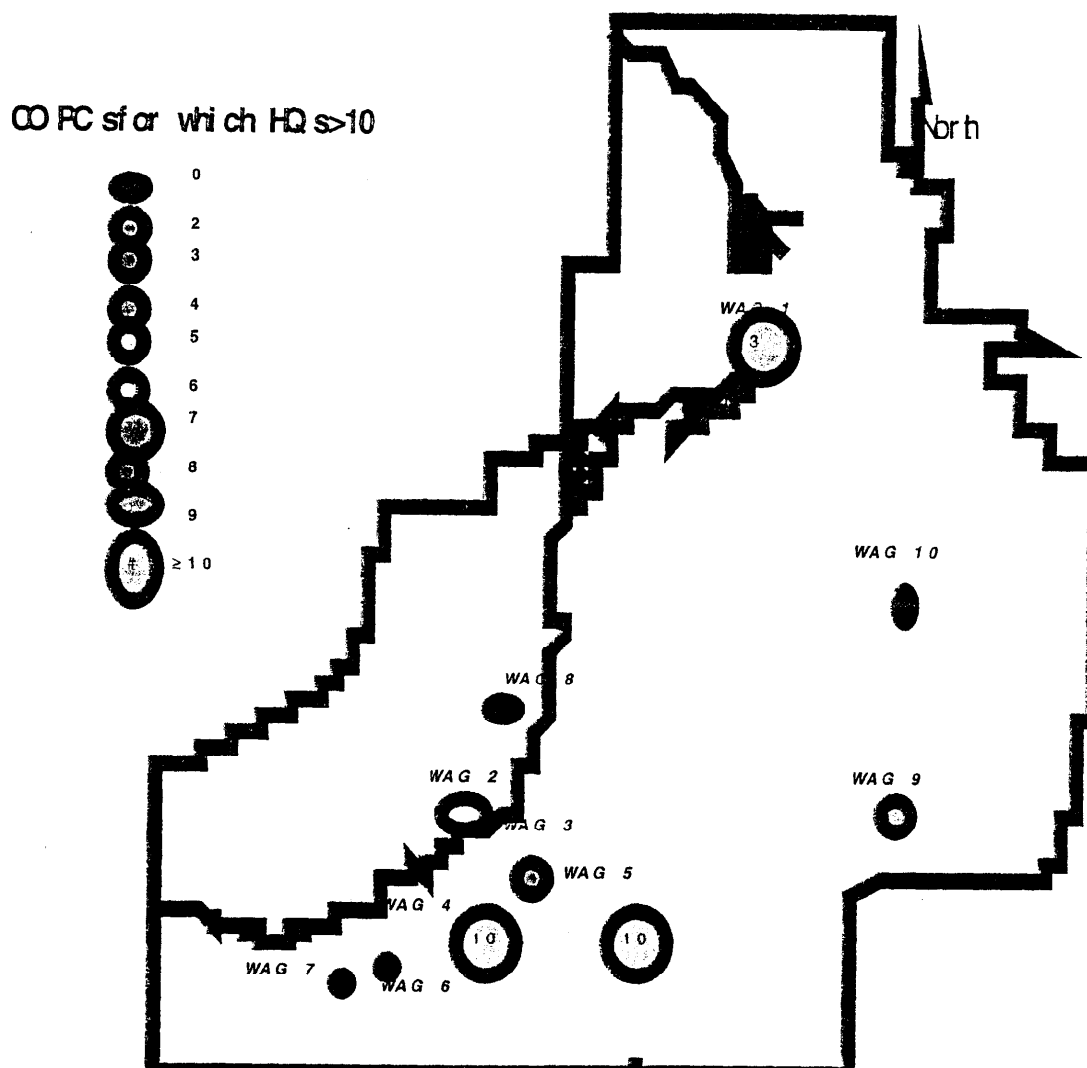
A summary of COPCs posing risk to avian omnivores is presented on Table A-4. A spatial summary of potential risk for avian omnivores is presented in Figure 6.



**Figure 6.** Summary of potential risk to avian omnivores (Black-billed magpie).

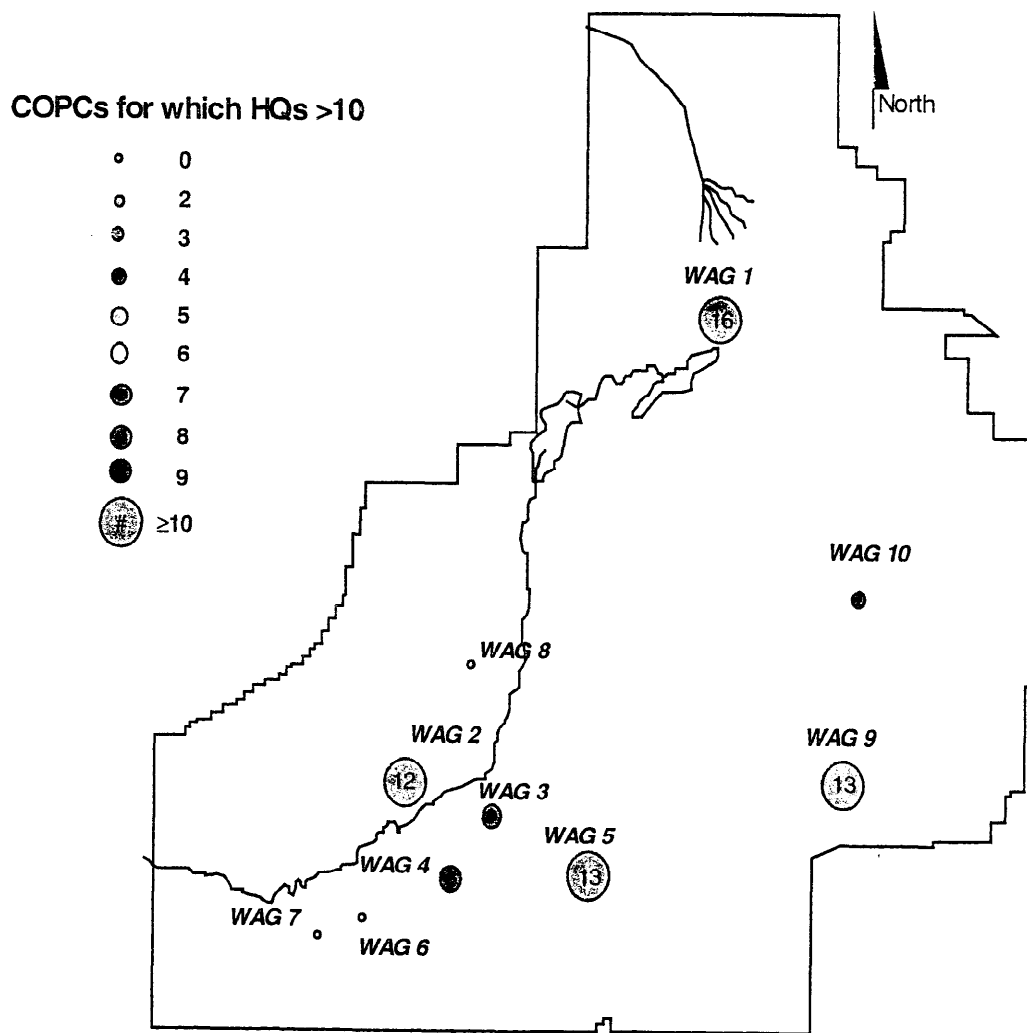
## H9-1.4 Mammalian Receptors

A summary of COPCs posing risk to mammalian herbivores is presented on Table A-9. A spatial summary of potential risk for mammalian herbivores is presented in Figure 7.



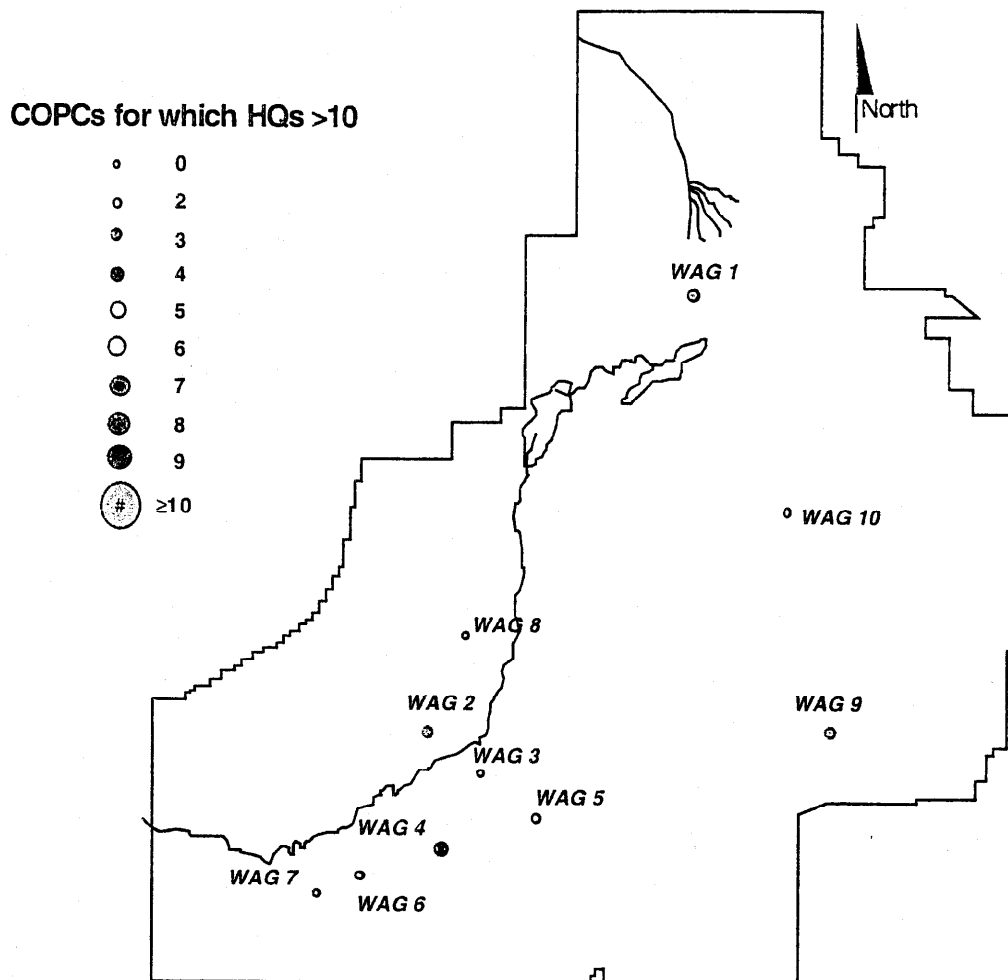
**Figure 7.** Summary of potential risk to mammalian herbivores (Mule deer).

A summary of COPCs posing risk to mammalian insectivores is given on Table A-2. A spatial summary of potential risk for mammalian insectivores is presented in Figure 8.



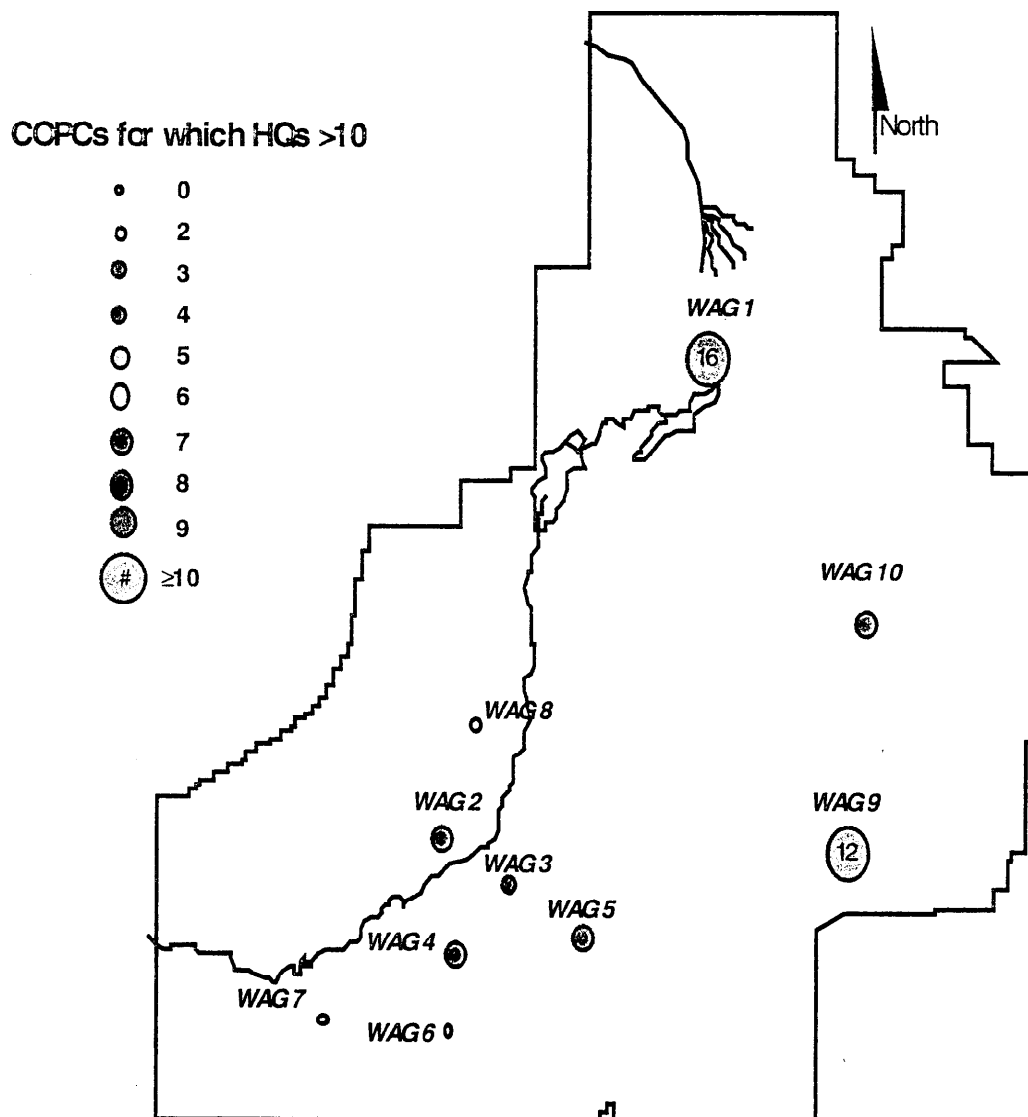
**Figure 8.** Summary of potential risk to mammalian insectivores (Townsend's western big-eared bat).

A summary of COPCs posing risk to mammalian carnivores is given on Table A-7. A spatial summary of potential risk for mammalian carnivores is presented in Figure 9.



**Figure 9.** Summary of potential risk mammalian carnivores (Coyote).

A summary of COPCs posing risk to mammalian omnivores is given on Table A-8. A spatial summary of potential risk for mammalian omnivores is presented in Figure 10.



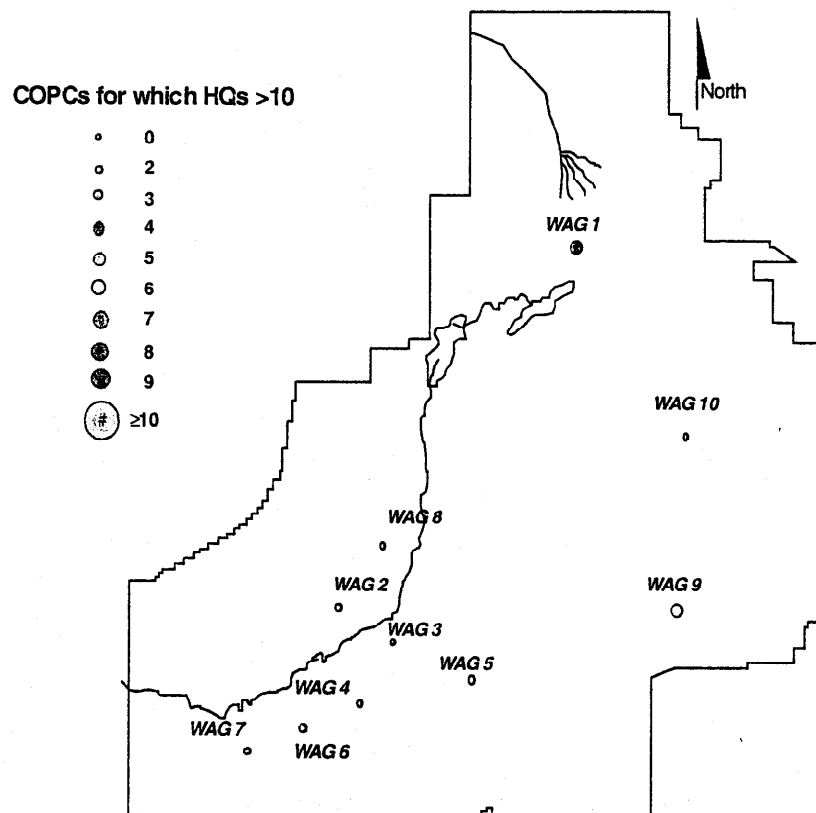
**Figure 10.** Summary of potential risk to mammalian omnivores (Deer mouse).

## H9-1.5 Reptilian Receptors

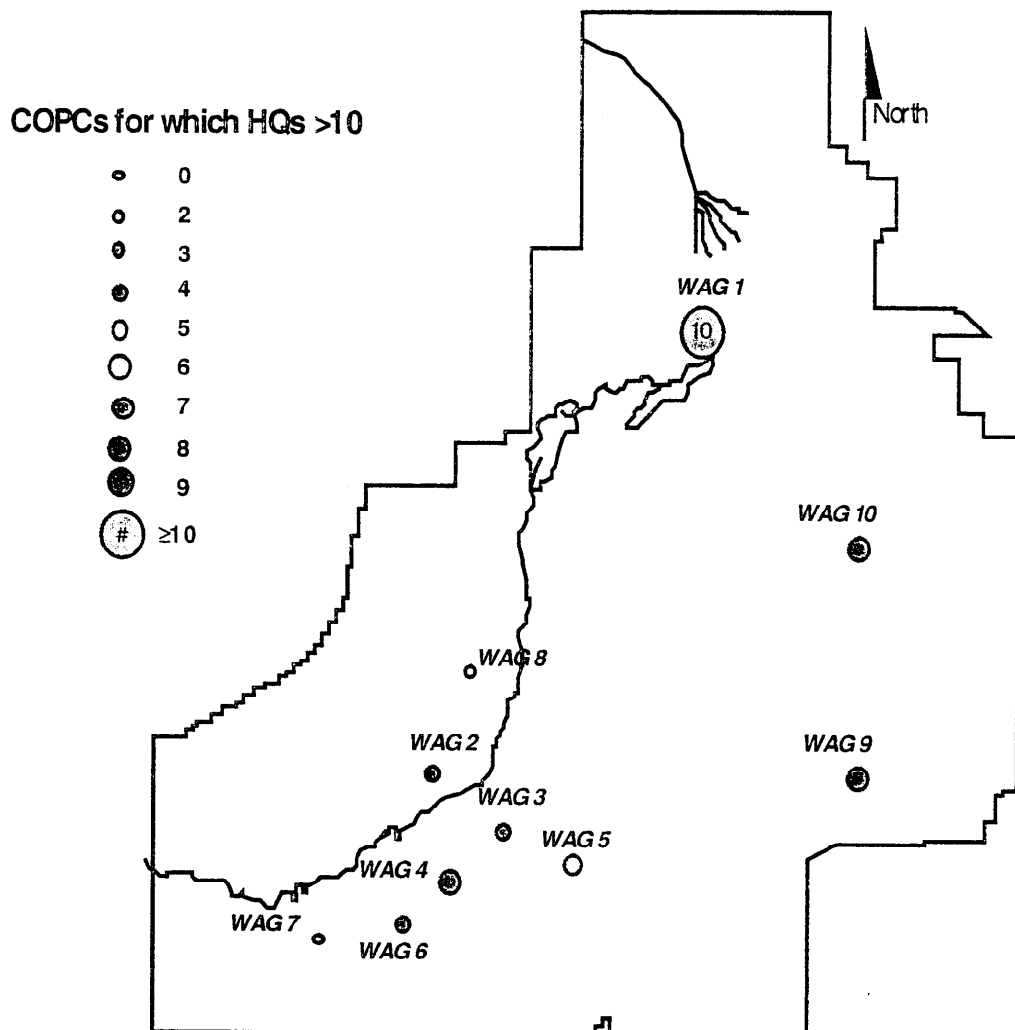
Reptilian receptors were not assessed in the WAG ERAs because toxicity data are not available. Therefore, these groups were carried through to the OU 10-04 ERA and addressed as a data gap and contribution to overall assessment uncertainty.

## H9-1.6 T/E and Sensitive Receptors

A summary of COPCs posing risk to bat species of concern is included on Table A-2. A summary for the pygmy rabbit is given on Table A-1. Summaries for the loggerhead shrike and burrowing owl appear on Table A-11. The exposures for the ferruginous hawk, peregrine falcon and bald eagle are given on Table A-10. Spatial summaries for the loggerhead shrike and burrowing owl are shown on Figure 5, for the ferruginous hawk, peregrine falcon and bald eagle on Figure 11, and for the pygmy rabbit on Figure 12.



**Figure 11.** Summary of potential risk to the ferruginous hawk peregrine falcon, and bald eagle.



**Figure 12.** Summary of potential risk to pygmy rabbit.

### H9-1.7 Invertebrate Receptors

Invertebrate receptors and microorganisms were not assessed in the WAG ERAs because of the lack of data. These receptors are included as a data gap and contribution to uncertainty in the OU 10-04 ERA.



## **Attachment 1**

### **Summary of WAG ERA Receptor Exposures**

**Table A1-1.** Summary of potential exposures from OU 10-04 COPCs to pygmy rabbits where HQs exceeded 10.

COPC	WAG 1	WAG 2	WAG 3	WAG 4	WAG 5	WAG 6	WAG 8	WAG 9	WAG 10
TPH	X	—	—	X	—	—	—	—	x
1,3-Dinitrobenzene	—	—	—	—	—	—	—	—	x
2,4-Dinitrotoluene	—	—	—	—	—	—	—	—	—
2-Methylnaphthalene	X	—	—	—	—	—	—	—	—
2,4,6-Trinitrotoluene	—	—	—	—	—	—	—	—	x
RDX	—	—	—	—	—	—	—	—	x
Xylene	—	—	—	X	—	—	—	—	—
Arsenic	—	—	—	—	—	—	—	—	—
Antimony	—	—	—	—	—	—	—	—	—
Barium	X	x	x	X	—	—	—	x	—
Cadmium	X	x	x	X	x	x	—	x	x
Chromium III	—	—	—	—	—	—	—	—	—
Chromium VI	x	—	—	x	x	—	—	x	—
Cobalt	x	—	—	—	—	—	—	—	—
Copper	X	—	—	x	x	—	—	x	—
Cyanide	—	—	—	—	—	—	—	—	—
Lead	—	—	—	—	—	—	—	—	x
Manganese	—	—	—	—	—	x	—	x	x
Mercury	X	x	x	X	x	x	—	x	—
Nickel	—	—	—	—	—	—	—	—	—
Selenium	—	—	—	—	—	—	—	x	—
Silver	x	—	—	—	—	—	—	—	—
Strontium	—	—	—	—	—	—	—	—	—
Thallium	—	—	—	—	—	—	—	—	—
Vanadium	—	—	—	—	—	—	—	—	—
Zinc	X	x	—	x	x	—	—	x	—
Total COPC/WAG	10	4	3	8	5	3	0	8	7

**Table A1-3.** Summary of potential exposures from OU 10-04 COPCs to avian herbivores (including the mourning dove) where HQs exceeded 10.

COPC	WAG 1	WAG 2	WAG 3	WAG 4	WAG 5	WAG 6	WAG 8	WAG 9	WAG 10
TPH*	—	—	—	—	—	—	—	—	—
1,3-Dinitrobenzene*	—	—	—	—	—	—	—	—	—
2,4-Dinitrotoluene*	—	—	—	—	—	—	—	—	—
2-Methylnaphthalene*	—	—	—	—	—	—	—	—	—
2,4,6-Trinitrotoluene*	—	—	—	—	—	—	—	—	—
RDX*	—	—	—	—	—	—	—	—	—
Xylene*	—	—	—	—	—	—	—	—	—
Arsenic	—	—	—	—	—	—	—	—	—
Antimony*	—	—	—	—	—	—	—	—	—
Barium*	—	—	—	—	—	—	—	—	—
Cadmium	x	x	—	—	—	—	—	x	—
Chromium III	—	—	—	—	—	—	—	x	—
Chromium VI*	—	—	—	—	—	—	—	—	—
Cobalt	—	—	—	—	—	—	—	—	x
Copper	—	—	—	—	—	—	—	—	—
Cyanide	—	—	—	—	—	—	—	—	—
Lead	x	x	—	—	x	—	—	x	x
Manganese	—	—	—	—	—	—	—	—	—
Mercury	X	x	x	x	x	—	—	x	—
Nickel	—	—	—	—	—	—	—	—	—
Selenium	—	—	—	—	—	—	—	—	—
Silver	—	—	—	—	—	—	—	—	—
Strontium*	—	—	—	—	—	—	—	—	—
Thallium	—	—	—	—	—	—	—	—	—
Vanadium	—	—	—	—	—	—	—	—	—
Zinc	x	—	—	—	—	—	—	x	—
<b>Total COPC/WAG</b>	<b>4</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>2</b>

\*. No toxicity values available for avian species.

**Table A1-4.** Summary of potential exposures from OU 10-04 COPCs to avian omnivores (including the magpie) where HQs exceeded 10.

COPC	WAG 1	WAG 2	WAG 3	WAG 4	WAG 5	WAG 6	WAG 8	WAG 9	WAG 10
TPH*	—	—	—	—	—	—	—	—	—
1,3-Dinitrobenzene*	—	—	—	—	—	—	—	—	—
2,4-Dinitrotoluene*	—	—	—	—	—	—	—	—	—
2-Methylnaphthalene*	—	—	—	—	—	—	—	—	—
2,4,6-Trinitrotoluene*	—	—	—	—	—	—	—	—	—
RDX*	—	—	—	—	—	—	—	—	—
Xylene*	—	—	—	—	—	—	—	—	—
Arsenic	—	—	—	—	—	—	—	—	—
Antimony*	—	—	—	—	—	—	—	—	—
Barium*	—	—	—	—	—	—	—	—	—
Cadmium	—	—	—	—	—	—	—	—	—
Chromium III	—	—	—	—	—	—	—	x	—
Chromium VI*	—	—	—	—	—	—	—	—	—
Cobalt	—	—	—	—	—	—	—	—	x
Copper	—	—	—	—	—	—	—	—	—
Cyanide	—	—	—	—	—	—	—	x	—
Lead	x	x	—	—	x	—	—	—	x
Manganese	—	—	—	—	—	—	—	—	—
Mercury	x	—	—	—	—	—	—	—	—
Nickel	—	—	—	—	—	—	—	—	—
Selenium	x	x	—	—	—	—	—	x	—
Silver	—	—	—	—	—	—	—	—	—
Strontium*	—	—	—	—	—	—	—	—	—
Thallium	—	—	—	—	—	—	—	—	—
Vanadium	—	—	—	—	—	—	—	—	—
Zinc	x	—	—	—	—	—	—	x	—
Total COPC/WAG	4	2	0	0	1	0	0	4	2

\* No toxicity values available for avian species

**Table A1-5.** Summary of potential exposures from OU 10-04 COPCs to avian insectivores (including the sage sparrow) where HQs exceeded 10.

COPC	WAG 1	WAG 2	WAG 3	WAG 4	WAG 5	WAG 6	WAG 8	WAG 9	WAG 10
TPH-diesel*	—	—	—	—	—	—	—	—	—
1,3-Dinitrobenzene*	—	—	—	—	—	—	—	—	—
2,4-Dinitrotoluene*	—	—	—	—	—	—	—	—	—
2-Methylnaphthalene*	—	—	—	—	—	—	—	—	—
2,4,6-Trinitrotoluene*	—	—	—	—	—	—	—	—	—
RDX*	—	—	—	—	—	—	—	—	—
Xylene*	—	—	—	—	—	—	—	—	—
Arsenic	x	x	—	—	—	—	—	x	—
Antimony*	—	—	—	—	—	—	—	—	—
Barium*	—	—	—	—	—	—	—	—	—
Cadmium	x	x	—	X	x	—	—	x	—
Chromium III	—	—	—	—	—	—	—	x	—
Chromium VI*	—	—	—	—	—	—	—	—	—
Cobalt	x	—	—	—	x	—	—	—	—
Copper	x	—	—	—	x	—	—	x	—
Cyanide	x	—	—	—	—	—	—	x	—
Lead	X	x	x	x	x	—	—	x	x
Manganese	—	—	—	—	—	—	—	—	—
Mercury	X	x	x	x	—	—	—	—	—
Nickel	—	—	—	x	—	—	—	x	—
Selenium	X	x	—	—	x	—	—	x	—
Silver	—	—	—	x	—	—	—	—	—
Strontium*	—	—	—	—	—	—	—	—	—
Thallium	X	x	—	—	x	—	—	—	—
Vanadium	X	x	—	—	x	—	—	x	—
Zinc	X	x	—	x	x	—	—	x	—
Total COPC/WAG	11	8	2	6	8	0	0	10	1

\*. No toxicity available for avian species.

**Table A1-6.** Summary of potential exposures to INEEL plant communities from OU 10-04 COPCs where HQs exceeded 10.

COPC	WAG 1	WAG 2	WAG 3	WAG 4	WAG 5	WAG 6	WAG 8	WAG 9	WAG 10
TPH*	—	—	—	—	—	—	—	—	—
1,3-Dinitrobenzene*	—	—	—	—	—	—	—	—	—
2,4-Dinitrotoluene*	—	—	—	—	—	—	—	—	—
2-Methylnaphthalene*	—	—	—	—	—	—	—	—	—
2,4,6-Trinitrotoluene*	—	—	—	—	—	—	—	—	—
RDX*	—	—	—	—	—	—	—	—	—
Xylene*	—	—	—	—	—	—	—	—	—
Arsenic	—	—	—	—	—	—	—	—	—
Antimony	—	—	—	—	—	—	—	x	—
Barium	—	—	—	—	—	—	—	—	—
Cadmium	—	—	x	—	—	—	—	—	—
Chromium III	X	x	x	—	—	—	—	x	—
Chromium VI	X	—	x	—	—	—	—	x	—
Cobalt*	—	—	—	—	—	—	—	X**	—
Copper	x	—	—	—	—	—	—	—	—
Cyanide*	—	—	—	—	—	—	—	—	—
Lead	X	—	—	—	—	—	—	—	—
Manganese	—	—	—	—	—	—	—	—	—
Mercury	X	x	x	X	—	—	—	X	—
Nickel	—	—	—	—	—	—	—	—	—
Selenium	—	x	—	—	—	—	—	—	—
Silver	X	x	—	x	x	—	—	x	—
Strontium*	—	—	—	—	—	—	—	—	—
Thallium	x	x	—	—	—	—	—	—	—
Vanadium	—	—	—	—	—	—	—	—	—
Zinc	—	—	—	—	—	—	—	x	X
Total COPC/WAG	7	5	4	2	1	0	0	7	1

\*. No plant toxicity value available.

\*\*.. WAG 9 used a toxicity value for plants.

**Table A1-7.** Summary of potential exposures from OU 10-04 COPCs to mammalian carnivores (including the coyote) where HQs exceeded 10.

COPC	WAG 1	WAG 2	WAG 3	WAG 4	WAG 5	WAG 6	WAG 8	WAG 9	WAG 10
TPH	—	—	—	—	—	—	—	—	—
1,3-Dinitrobenzene	—	—	—	—	—	—	—	—	—
2,4-Dinitrotoluene	—	—	—	—	—	—	—	—	—
2-Methylnaphthalene	—	—	—	—	—	—	—	—	—
2,4,6-Trinitrotoluene	—	—	—	—	—	—	—	—	—
RDX	—	—	—	—	—	—	—	—	—
Xylene	—	—	—	—	—	—	—	—	—
Arsenic	—	—	—	—	—	—	—	—	—
Antimony	—	—	—	—	—	—	—	—	—
Barium	x	x	—	x	—	—	—	x	—
Cadmium	x	x	—	X	x	—	—	X	—
Chromium III	—	—	—	—	—	—	—	—	—
Chromium VI	—	—	—	—	x	—	—	x	—
Cobalt	—	—	—	—	—	—	—	—	—
Copper	—	—	—	—	—	—	—	—	—
Cyanide	—	—	—	—	—	—	—	—	—
Lead	—	—	—	—	—	—	—	—	—
Manganese	—	—	—	—	—	—	—	—	—
Mercury	x	x	—	X	—	—	—	—	—
Nickel	—	—	—	—	—	—	—	—	—
Selenium	—	—	—	—	—	—	—	—	—
Silver	—	—	—	—	—	—	—	—	—
Strontium	—	—	—	—	—	—	—	—	—
Thallium	—	—	—	—	—	—	—	—	—
Vanadium	—	—	—	—	—	—	—	—	—
Zinc	—	—	—	—	—	—	—	—	—
Total COPC/WAG	3	3	0	3	2	0	0	3	0

**Table A1-8.** Summary of potential exposures from OU 10-04 COPCs to mammalian omnivores (including the deer mouse) where HQs exceeded 10.

COPC	WAG 1	WAG 2	WAG 3	WAG 4	WAG 5	WAG 6	WAG 8	WAG 9	WAG 10
TPH	X	—	—	—	—	—	—	—	—
1,3-Dinitrobenzene	—	—	—	—	—	—	—	—	x
2,4-Dinitrotoluene	—	—	—	—	—	—	—	—	—
2-Methylnaphthalene	—	—	—	—	—	—	—	—	—
2,4,6-Trinitrotoluene	—	—	—	—	—	—	—	—	X
RDX	—	—	—	—	—	—	—	—	X
Xylene	—	X	—	X	—	—	—	—	—
Arsenic	x	x	—	—	—	—	—	x	—
Antimony	x	—	—	—	—	—	—	—	—
Barium	x	x	x	X	—	—	—	x	x
Cadmium	X	x	x	X	x	—	—	x	x
Chromium III	—	—	—	—	—	—	—	—	—
Chromium VI	x	—	—	x	x	—	—	x	—
Cobalt	x	—	—	—	—	—	—	—	—
Copper	X	x	—	X	x	—	—	x	x
Cyanide	—	—	—	—	—	—	—	—	—
Lead	x	—	—	—	—	—	—	—	x
Manganese	—	—	—	—	—	—	—	x	—
Mercury	X	x	x	X	x	—	—	x	—
Nickel	x	—	—	x	—	—	—	x	—
Selenium	X	x	—	—	x	—	—	x	—
Silver	x	—	—	—	—	—	—	x	—
Strontium	—	—	—	—	—	—	—	—	—
Thallium	X	—	—	—	x	—	—	—	—
Vanadium	x	—	—	—	x	—	—	x	—
Zinc	X	—	—	—	—	—	—	x	—
Total COPC/WAG	16	7	3	7	7	0	0	12	7

**Table A1-9.** Summary of potential exposures from OU 10-04 COPCs to mammalian herbivores (including the mule deer) where HQs exceeded 10.

COPC	WAG 1	WAG 2	WAG 3	WAG 4	WAG 5	WAG 6	WAG 8	WAG 9	WAG 10
TPH	X	—	—	X	—	—	—	—	—
1,3-Dinitrobenzene	—	—	—	—	—	—	—	—	—
2,4-Dinitrotoluene	—	—	—	—	—	—	—	—	—
2-Methylnaphthalene	—	—	—	—	—	—	—	—	—
2,4,6-Trinitrotoluene	—	—	—	—	—	—	—	—	—
RDX	—	—	—	—	—	—	—	—	—
Xylene	—	—	—	X—	—	—	—	—	—
Arsenic	—	—	—	—	—	—	—	—	—
Antimony	—	—	—	—	—	—	—	—	—
Barium	X	x	x	X	—	—	—	x	—
Cadmium	X	x	x	X	x	—	—	x	x
Chromium III	—	—	—	—	—	—	—	—	—
Chromium VI	x	—	—	x	x	—	—	x	—
Cobalt	x	—	—	—	x	—	—	—	—
Copper	X	x	—	X	x	—	—	x	—
Cyanide	—	—	—	—	—	—	—	—	—
Lead	x	—	—	x	—	—	—	—	—
Manganese	x	—	—	—	—	—	—	x	—
Mercury	X	x	x	X	x	—	—	x	—
Nickel	—	—	—	x	—	—	—	—	—
Selenium	x	x	—	—	x	—	—	x	—
Silver	x	—	—	—	x	—	—	x	—
Strontium	—	—	—	—	—	—	—	—	—
Thallium	x	—	—	—	x	—	—	—	—
Vanadium	—	—	—	—	x	—	—	—	—
Zinc	X	x	—	x	x	—	—	x	—
Total COPC/WAG	13	6	3	10	10	0	0	9	1

**Table A1-10.** Summary of potential exposures from OU 10-04 COPCs to avian carnivores (including the ferruginous hawk, peregrine falcon and bald eagle) where HQs exceeded 10.

COPC	WAG 1	WAG 2	WAG 3	WAG 4	WAG 5	WAG 6	WAG 8	WAG 9	WAG 10
TPH*	—	—	—	—	—	—	—	—	—
1,3-Dinitrobenzene*	—	—	—	—	—	—	—	—	—
2,4-Dinitrotoluene*	—	—	—	—	—	—	—	—	—
2-Methylnaphthalene*	—	—	—	—	—	—	—	—	—
2,4,6-Trinitrotoluene*	—	—	—	—	—	—	—	—	—
RDX*	—	—	—	—	—	—	—	—	—
Xylene*	—	—	—	—	—	—	—	—	—
Arsenic	—	—	—	—	—	—	—	—	—
Antimony*	—	—	—	—	—	—	—	—	—
Barium*	—	—	—	—	—	—	—	—	—
Cadmium	x	x	—	—	x	—	—	x	—
Chromium III	—	—	—	—	—	—	—	x	—
Chromium VI*	—	—	—	—	—	—	—	—	—
Cobalt	—	—	—	—	—	—	—	—	—
Copper	—	—	—	—	—	—	—	—	—
Cyanide	—	—	—	—	—	—	—	x	—
Lead	x	x	—	x	x	—	—	x	—
Manganese	—	—	—	—	—	—	—	—	—
Mercury	x	—	—	—	—	—	—	—	—
Nickel	—	—	—	—	—	—	—	—	—
Selenium	—	—	—	—	—	—	—	—	—
Silver	—	—	—	—	—	—	—	—	—
Strontium*	—	—	—	—	—	—	—	—	—
Thallium	—	—	—	—	—	—	—	—	—
Vanadium	—	—	—	—	—	—	—	—	—
Zinc	x	—	—	—	—	—	—	x	—
Total COPC/WAG	4	2	0	1	2	0	0	5	0

\*. No toxicity values for avian receptors.

**Table A1-11.** Summary of potential exposures from OU 10-04 COPCs to avian carnivores (including the loggerhead shrike and burrowing owl) where HQs exceeded 10.

COPC	WAG 1	WAG 2	WAG 3	WAG 4	WAG 5	WAG 6	WAG 8	WAG 9	WAG 10
TPH*	—	—	—	—	—	—	—	—	—
1,3-Dinitrobenzene*	—	—	—	—	—	—	—	—	—
2,4-Dinitrotoluene*	—	—	—	—	—	—	—	—	—
2-Methylnaphthalene*	—	—	—	—	—	—	—	—	—
2,4,6-Trinitrotoluene*	—	—	—	—	—	—	—	—	—
RDX*	—	—	—	—	—	—	—	—	—
Xylene*	—	—	—	—	—	—	—	—	—
Arsenic	—	—	—	—	—	—	—	—	—
Antimony*	—	—	—	—	—	—	—	—	—
Barium*	—	—	—	—	—	—	—	—	—
Cadmium	x	X	—	—	x	—	—	x	x
Chromium III	—	—	—	—	—	—	—	x	—
Chromium VI*	—	—	—	—	—	—	—	—	—
Cobalt	—	—	—	—	—	—	—	—	—
Copper	—	—	—	—	—	—	—	—	—
Cyanide	—	—	—	—	—	—	—	x	—
Lead	x	x	—	x	x	—	—	x	x
Manganese	—	—	—	—	—	—	—	—	—
Mercury	x	—	—	—	—	—	—	—	—
Nickel	—	—	—	—	—	—	—	—	—
Selenium	—	—	—	—	—	—	—	—	—
Silver	—	—	—	—	—	—	—	—	—
Strontium*	—	—	—	—	—	—	—	—	—
Thallium	—	—	—	—	—	—	—	—	—
Vanadium	—	—	—	—	—	—	—	—	—
Zinc	x	—	—	—	—	—	—	x	—
Total COPC/WAG	4	2	0	1	2	0	0	5	2

\*. No toxicity values for avian receptors.

**Appendix H10**  
**Breeding Bird Surveys**

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## **Appendix H10**

### **Breeding Birds Summary**

During the 1960s, Chandler Robbins and his associates at the Migratory Bird Population Station (now the Patuxent Environmental Science Center) in Laurel, Maryland developed the concept of a continental monitoring program for all breeding birds. The roadside survey methodology was field tested during 1965, and the North American Breeding Bird Survey (BBS) was formally launched in 1966 when approximately 600 surveys were conducted in the U.S. and Canada east of the Mississippi River.

The BBS continued to grow as more birders became aware of the program. Today there are approximately 3700 active BBS routes across the continental U.S. and Canada, of which nearly 2900 are surveyed annually.

Breeding Bird Surveys are conducted during the peak of the nesting season, primarily in June, although surveys in desert regions and some southern states, (where the breeding season begins earlier), are conducted in May. Breeding bird surveys are generally conducted during the month of June at the INEEL (June 11-27 for 1999).

The BBS was designed to provide a continent-wide perspective of population change. Routes are randomly located in order to sample habitats that are representative of the entire region. Other requirements such as consistent methodology and observer expertise, visiting the same stops each year, and conducting surveys under suitable weather conditions are necessary to produce comparable data over time. A large sample size, (number of routes), is needed to average local variations and reduce the effects of sampling error, (variation in counts attributable to both sampling technique and real variation in trends) (Sauer et al., 1997).

In 1985 several mini-routes were established at the INEEL. Researchers make stops every one-half mile along the routes for three minutes. Birds seen or heard within 0.4 kilometers of each stop are counted. Over 6000 birds were counted in 1999. This is a significant increase in the number of birds counted from the beginning of the surveys in the mid 1980s where only 4400 birds on average were counted. The number of species sighted at the INEEL has also increased during this time period (66 species were counted on the INEEL in 1999). Bird surveys were not performed every year from 1985 to 1999 due to a lack of funding. While this does cause some data gaps to occur, researchers are still able to utilize the data and see trends in species numbers.

Insufficient route coverage over much of the western United States has limited attempts to compare trends in BBS data for populations of many western species (Sauer and Droege, 1992). Using established routes from year to year and protocols allows for consistency in reporting. However there is always an amount of uncertainty involved in these surveys. Surveys are only conducted when weather conditions are satisfactory as prescribed by the BBS protocol. Cool wet Junes from 1985 to 1991 yielded higher bird counts than in other years. If days are missed or postponed due to the weather, flocks of migrating birds may pass through the area without being counted. Birds are recorded based on sight and sound. If a researcher records a bird mistakenly on sound or records the same bird in flight at two different stops the results may be inadvertently skewed. However the consistency of the counts and the use of established routes from year to year minimizes the uncertainty and allows for credible results.

Seven avian ecological receptors were chosen in the OU 10-04 ERA as part of the evaluation of ecosystem values, goods, and benefits. A brief description of each receptor and their habits is presented in the following sections. The BBS numbers from the INEEL were compared to the state trends and national trends using the USGS website (USGS, 2000). The population trends are summarized in Table 1. Bird populations from the state of Idaho and the nation as a whole from the past 20 were analyzed as a similar timeframe for surveys conducted at the INEEL from 1985 to 1999. Breeding bird populations for the seven target species have remained constant with an increase in the number of mourning doves. This is encouraging when compared to the trends found throughout Idaho. Loggerhead shrike, Ferruginous hawks, mourning doves, blue-wing teal, and sage sparrows have all seen declines in their numbers in Idaho. Sage sparrows have seen a significant decrease in their numbers over the past 20 years. Only the black-billed magpie and the burrowing owl have seen slight increase in Idaho during this timeframe. The national trends are more promising. Only the loggerhead shrike and mourning dove have experienced population declines over this twenty-year span. The Ferruginous hawk, burrowing owl, blue-wing teal, sage sparrow, and black-billed magpie have all seen increases in their population numbers.

**Table H10-1.** Summary of bird population trends.

	INEEL populations	State of Idaho Populations	United States Nationwide Populations
Loggerhead shrike	*	-	-
Ferruginous hawk	*	-	+
Burrowing owl	*	+	+
Mourning dove	+	-	-
Blue-wing teal	*	-	+
Sage sparrow	*	--	+
<u>Black-billed magpie</u>	*	+	+

\* No change or little change in population

+ Slight to moderate increase in population

- Slight to moderate decrease in population

-- Significant decrease in population

## **H10-1. LOGGERHEAD SHRIKE (*LANIUS LUDOVICIANUS*)**

Loggerhead shrikes are a medium sized songbird roughly the size of a mockingbird, 8-10 inches long. Loggerhead shrikes have a distinctive black mask, black wings and tail, and gray head and underparts. Shrikes also have a heavy, hooked bill.

Loggerhead shrikes built nests in heavily-foliaged trees and bushes 5-20 feet high. The shrikes winter in North America and can be found in shrub-steppe habitats similar to the INEEL.

Shrikes feed on large insects and occasionally other birds and small mammals. Loggerhead shrikes have been called "Butcher birds" due to its habit of storing excess food by impaling it on thorns and barbed wire.

Shrike numbers on the INEEL have remained fairly consistent since the early 1990s with the greatest number of birds being sighted in the mid 1980s (see table below). Idaho has seen a decrease in the number of Loggerhead shrikes during this time period. The United States as a whole has seen a slight decrease also (USGS, 2000). The loggerhead shrike is still listed as a species of concern (see T/E table in Appendix H).

Year	Frequency	Percent	Cumulative Frequency	Cumulative Percent
85	65	14.4	65	14.4
86	48	10.6	113	25.0
87	53	11.7	166	36.7
88	13	2.9	179	39.6
89	19	4.2	198	43.8
90	47	10.4	245	54.2
91	35	7.7	280	61.9
94	32	7.1	312	69.0
95	9	2.0	321	71.0
96	16	3.5	337	74.6
97	47	10.4	384	85.0
98	36	8.0	420	92.9
99	32	7.1	452	100.0

(Belthoff, J.R. and E.A. Ellsworth, 1999)

## **H10-2. FERRUGINOUS HAWK (*BUTEO REGALIS*)**

The ferruginous hawk is the largest hawk in North America. They are approximately 20 inches in length with a wingspan of 54 inches, which ends in rounded wing tips. These hawks can be identified by the pale head, neck, breast, and belly. Their legs are feathered to the toes and have a rufous coloring on the wings, tail, and underwing.

Ferruginous hawks build big, bulky nests in isolated trees, rocky ledges, or the ground. They are found throughout western North America. These hawks are found in limited numbers at the INEEL even though suitable habitat is found throughout the INEEL.

Almost 90% of the ferruginous hawk diet consists of gophers. Voles, mice, and white-tailed jackrabbits makeup a portion of the rest of its diet.

The number of ferruginous hawks sighted on the INEEL during the 15 years of the breeding birds survey has remained consistent (see table below). There does not seem to be a trend towards a decrease or an increase in the numbers of birds. Idaho has seen a slight decrease in the number of birds during this time period. The United States as a whole on the other hand has seen a slight increase during this time period (USGS, 2000). The ferruginous hawk is still listed as a species of concern (see T/E table in Appendix H).

Year	Frequency	Percent	Cumulative Frequency	Cumulative Percent
85	14	8.5	14	8.5
86	16	9.7	30	18.2
87	18	10.9	48	29.1
88	14	8.5	62	37.6
89	14	8.5	76	46.1
90	11	6.7	87	52.7
91	8	4.8	95	57.6
94	6	3.6	101	61.2
95	12	7.3	113	68.5
96	9	5.5	122	73.9
97	16	9.7	138	83.6
98	14	8.5	152	92.1
99	13	7.9	165	100.0

(Belthoff, J.R. and E.A. Ellsworth, 1999)

### **H10-3. BURROWING OWL (ATHENE CUNICULARIA)**

The burrowing owl is a small, long-legged, ground-dwelling owl. They live in abandoned burrows in the ground taken over and modified from badgers, foxes, or gophers. Burrowing owls are approximately 8 inches long with a 22 inch wingspan. These owls can be identified by the white spotting on the back, chest, and head. They have yellow eyes and a yellow bill.

Burrowing owls are active early in the day and eat insects, rodents, small birds, toads and dead animals. They are primarily found along grasslands and shrub-steppe areas.

Very few burrowing owls have been sighted on the INEEL as is evidenced in the breeding bird survey numbers. Only one bird was sighted in 1999. The highest number of birds sighted during the study from 1985 to 1999 was 8 in 1985. Although only one bird was sighted this past year the number of burrowing owls sighted during the 15 years of this study has remained fairly constant (see table below). Recent studies conducted at the INEEL documented an increase in the numbers of burrowing owls which exceed the numbers cited in reports from the mid 1970s (Weigmann, D. L. and R. D. Blew, 1999). Idaho's total burrowing owl population has slightly increased during this time period. This is consistent with the national average throughout the United States which also has seen a slight increase in burrowing owl numbers (USGS, 2000). The burrowing owl is still listed as a species of concern (see T/E table in Appendix H).

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Year	Frequency	Percent	Cumulative Frequency	Cumulative Percent
85	8	28.6	8	28.6
86	4	14.3	12	42.9
89	1	3.6	13	46.4
94	5	17.9	18	64.3
97	3	10.7	21	75.0
98	6	21.4	27	96.4
99	1	3.6	28	100.0

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(Belthoff, J.R. and E.A. Ellsworth, 1999)

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#### **H10-4. MOURNING DOVE (*ZENaida MACROURA*)**

Mourning doves are approximately 12 inches long with short legs. The body is a brown or grayish color with a tinge of pink in its breast. These doves are an abundant game bird which thrives in open or semi-open lands particularly around areas where grain crops are grown.

Mourning doves nest in trees along the edges of fields, clearings, or pastures. Their nests are typically 10 to 30 feet above the ground. Their diet almost exclusively consists of seeds and weeds. Doves will also feed on insects.

Mourning dove numbers have steadily increased from 1985 to the present day (see table below). Several groups of doves were sighted everyday during the field sampling efforts this summer. Unlike the INEEL the state of Idaho has seen a slight decrease in the number of mourning doves. This decline is also seen in the United States as a whole (USGS, 2000). The mourning dove is not a listed species.

Year	Frequency	Percent	Cumulative Frequency	Cumulative Percent
85	97	3.1	97	3.1
86	103	3.3	200	6.3
87	160	5.1	360	11.4
88	75	2.4	435	13.8
89	214	6.8	649	20.5
90	242	7.7	891	28.2
91	105	3.3	996	31.5
94	488	15.4	1484	46.9
95	344	10.9	1828	57.8
96	383	12.1	2211	69.9
97	339	10.7	2550	80.7
98	195	6.2	2745	86.8
99	416	13.2	3161	100.0

(Belthoff, J.R. and E.A. Ellsworth, 1999)

## **H10-5. BLUE-WINGED TEAL (*ANUS DISCORS*)**

Blue-winged teal are approximately 11 inches in length with a wingspan of 24 inches. The male teal has a bluish-gray head accented with a white crescent on either side in front of the eyes. Their bodies are pinkish-brown, with white flanks, and a black tail. Female teal are brown both on the head and on the body. The chalky-blue forewings distinguish them from the green-winged teal.

Nests of the blue-winged teal are basket-like and usually well concealed in dense grass near water. Teal are usually found near water and have been spotted on the Big Lost River and the various ponds on the INEEL.

Teal will feed on aquatic vegetation and other travel to grain fields during the day to feed on grains.

Blue-winged teal have been spotted occasionally during the breeding bird surveys with the greatest number of teal seen in 1989. Over the past several years the number of blue-winged teal sighted has been consistent (see table below). The state of Idaho has seen a slight decrease in the number of blue-winged teal during this time period. The United States as a whole has seen a slight increase in the number of birds (USGS, 2000). The blue-winged teal is not a listed species.

Year	Frequency	Percent	Cumulative Frequency	Cumulative Percent
85	3	9.1	3	9.1
89	12	36.4	15	45.5
91	11	33.3	26	78.8
94	1	3.0	27	81.8
95	2	6.1	29	87.9
98	2	6.1	31	93.9
99	2	6.1	33	100.0

(Belthoff, J.R. and E.A. Ellsworth, 1999)

## **H10-6. SAGE SPARROW (AMPHISPIZA BELLI)**

Sage sparrows are a small bird approximately 5 inches in length. These sparrows have a broken eye ring. They have a gray crown, back, and wings offset by their white underparts. Sage sparrows also have a long dark tail.

Sage sparrows build nests close to the ground in clumps of grass, low trees, or bushes. The habitat of the INEEL is very conducive to these birds nesting requirements.

Sage sparrows eat a variety of seeds and insects. Several of these birds have been caught and released in live traps during the past several summer sampling efforts at the INEEL. The traps have been baited with oats, peanut butter, and molasses which apparently attract the small birds. Sage sparrows are sagebrush obligates and quite common to shrub-steppe areas like the INEEL.

Sage sparrows are the 5<sup>th</sup> most commonly sighted species on the INEEL as evidenced in the breeding bird surveys. The number of birds sighted during these studies has remained fairly consistent with an increase in the number of birds yearly until 1999 (see table below). This is in contrast to the marked decrease in the number of sage sparrows found throughout Idaho during this time period. The United States as a whole has seen an increase in the populations during the same time period (USGS, 2000). The sage sparrow is not a listed species.

Year	Frequency	Percent	Cumulative Frequency	Cumulative Percent
85	580	6.7	580	6.7
86	254	2.9	834	9.7
87	240	2.8	1074	12.4
88	461	5.3	1535	17.8
89	332	3.8	1867	21.6
90	938	10.9	2805	32.5
91	926	10.7	3731	43.2
94	779	9.0	4510	52.2
95	702	8.1	5212	60.4
96	764	8.8	5976	69.2
97	1043	12.1	7019	81.3
98	1090	12.6	8109	93.9
99	526	6.1	8635	100.0

(Belthoff, J.R. and E.A. Ellsworth, 1999)

## **H10-7. BLACK-BILLED MAGPIE (*PICA PICA*)**

Black-billed magpies are approximately 18 inches in length. These birds are distinguished by their black and white coloration. The black-billed magpie is distinguished from the yellow-billed magpie by the black colored bill. These birds have a long iridescent blue-green tails.

Black-billed magpies build large, round nests of twigs cemented with mud in small thorny trees or junipers. Their diets consist of insects, seeds, small vertebrates, the eggs and young of other birds, and carrion.

Magpies are found in several areas and are known to frequent desert shrub, sagebrush-grasslands, and juniper habitats like those found on the INEEL.

The number of magpies found during the breeding bird surveys has remained fairly consisted over the 15 year span (see table below). The state of Idaho has seen a slight increase if any in the populations of black-billed magpies. The United States as a whole also has seen a slight increase in their numbers (USGS 2000). The sage black-billed magpie is not a listed species.

Year	Frequency	Percent	Cumulative Frequency	Cumulative Percent
85	28	9.7	28	9.7
86	46	15.9	74	25.6
87	31	10.7	105	36.3
88	21	7.3	126	43.6
89	12	4.2	138	47.8
90	10	3.5	148	51.2
91	16	5.5	164	56.7
94	38	13.1	202	69.9
95	8	2.8	210	72.7
96	13	4.5	223	77.2
97	15	5.2	238	82.4
98	21	7.3	259	89.6
99	30	10.4	289	100.0

(Belthoff, J.R. and E.A. Ellsworth, 1999)

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